

**SURVEY OF SPACE ENVIRONMENT SERVICES CENTER
USERS AND SERVICES**

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ABSTRACT

The Space Environment Services Center (SESC) provides various products and services in support of users of solar-terrestrial information. In the past, representation by users of solar-terrestrial data and predictions services has been regrettably low at the Solar Terrestrial Predictions (STP) Workshops. For users of solar-terrestrial information, and especially those who would be unable to attend the workshop, a survey was designed to help present their views. The survey presents a statistical study of the types of users surveyed, the SESC products and services used, how SESC is meeting user needs, and how SESC can improve products and services to the user. Results of this survey will enable SESC to provide more useful and effective products and services to the user.

1. INTRODUCTION

The National Oceanic and Atmospheric Administration's (NOAA) Space Environment Laboratory (SEL) Space Environment Services Center (SESC) provides space weather forecasts and warnings for civilian and military space activities and programs sensitive to environmental disturbances in space and the upper atmosphere. Products and services are provided and maintained, on a range of time scales, by SESC for user access. To represent the views of the user at the STP Workshop, SESC designed and mailed a survey in September 1991 to its users. A copy of the survey is shown in Attachment 1. Users of solar-terrestrial information are diverse and have a myriad of interests; For this reason, the survey asked specific questions of them. For the purpose of this paper, the results of the survey were then combined into four categories:

- o Types of users surveyed
- o SESC products and services used
- o Meeting the users needs
- o How SESC can improve products and services

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Each question contained various choices for response. The survey covered 14 categories of user occupations or interests. Information provided by SESC to the user was divided into two categories, indices and activity. Information on delivery of products and services was represented by listing 16 methods for that process. In addition, users were asked how well SESC is meeting their needs. Needed improvements to SESC products and services are suggested by user responses concerning their use of the service and educational materials that may be provided.

Approximately 1000 surveys were mailed, and 453 users (45%) responded. This paper presents the user groups responding, the indices and activity requested, and how well SESC is meeting the needs of each user. Considerations of multiple user types, multiple uses of SESC information, or whether a user receives information in more than one way are not presented. This survey will be used to guide SESC in decisions concerning products and services provided to users.

2. TYPES OF USERS SURVEYED

For almost 150 years, there have been reports on effects of solar activity on man-made systems (Kappenman and Albertson 1990). From early telegraph systems to today's telecommunication networks, none of these have been totally exempt from the disturbances caused by the sun.

Disturbances in the space environment can affect satellites and people in space as well as Earth-based systems, and great monetary losses can be accrued. Users of SESC information range from the amateur astronomer to satellite operators. Satellite operators are concerned with conducting scientific studies, ground-to-spacecraft communication, and telephone links around the world.

Within the biological systems are users with concerns for safety of the shuttle crews and passengers on high-flying aircraft. Also found in this category are users interested in the biological effects on migratory animals such as homing pigeons.

The individuals surveyed by SESC were located by examining four available data lists. These included the mailing lists of (1) the Preliminary Report and Forecast of Solar and Geophysical Data, (2) the SESC Monthly Report, (3) a listing of computer dial-up SELDADS users, and (4) participants of the SESC Users Conference in May 1990. The survey did not include users requesting short-term support (from customer support logs) or "second-hand" users (those receiving information from a known SESC user).

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Of the 14 categories of user occupations or interest types responding to the survey, researchers (35%) were at the top of the list. Amateur radio operators (15%) were the second largest group, and satellite operations (11%) ranked third. Attachment 2 shows the percent of each user type among those responding to the survey.

3. SESC PRODUCTS AND SERVICES USED

Geomagnetic storms are responsible for a variety of disturbances that can produce significant safety and economic impacts. This was evident from the activity in March 1989 which was very disruptive to electric power systems in the northern U.S. and Canada (Barnes and Van Dyke 1991). Hydro-Quebec suffered a system-wide blackout that took more than 9 hours to restore, leaving six million citizens in the dark. The Salem nuclear power plant had to replace transformers at the cost of several million dollars.

Energetic particles from solar flares can pose radiation hazards for crews in space. Though flare activity is not a danger to Shuttle crews flying in low inclination orbit the circumstances for such danger can occur. The cost and effect of this type of exposure is not completely known.

The SESC continuously monitors, analyzes, and forecasts the environment between the Sun and Earth. Real-time data are acquired from ground and satellite based stations around the world, on a 24-hour, 7-day-a-week basis. SESC processes and disseminates solar and geomagnetic data in various forms to users worldwide. For the purpose of the survey, information provided by SESC was presented in two categories, indices and activity. A third category, "other," was also an option; 8% of users responded in this category. Most of the "other" responses were requests for additional information on coronal holes, aurora, and the solar wind.

Each category was further broken into subsets (i.e. the forecast period, frequency of use, and usefulness of the data) which will be used by SESC at a later date to improve its products. Solar flux (46%) was the most requested of indices; solar flares (42%) were the most requested from the activity category. Preferences of the top four users in the categories of indices and activity are shown in Attachments 3 and 4.

4. MEETING THE USERS NEEDS

It is very important to know how the user receives information from SESC. SESC issues products and services through a wide variety of communication systems: telephone, teletype, fax, mail, radio broadcasts, satellite broadcasts, computer dial-up, and electronic file transfer over computer networks.

The survey presented 16 SESC products and services. The methods of delivery and a detailed description of the products and services are found in the Space Environment Services Center Products and Services (Draft) manual. The survey results indicate that 73% of the users received information through SESC Preliminary Report and Forecast Of Solar Geophysical Data, a weekly publication sent by mail.

Users were also asked if their needs were being met by SESC. The consensus, within the framework of current technology, indicated that the majority of respondents felt that their needs were more than adequately met. The responses were as follows:

- o 70% - needs were met
- o 16% - needs partially met (or somewhat)
- o 1% - needs not met
- o 13% - did not respond

Attachment 5 shows the top four users' responses to this question.

5. HOW SESC CAN IMPROVE PRODUCTS AND SERVICES

Possible long-term improvements for SESC products or services were suggested by approximately 8% of the survey respondents. They indicated the need for an ionospheric prediction model, additional sensors, or improved forecast accuracy.

An ionospheric prediction model was requested that would provide point-to-point predictions of a variety of high-frequency (HF) radio propagation parameters (i.e. Maximum Usable Frequency (MUF), Frequency of Optimum Transmission (FOT), etc., for single- or multiple-hop paths). These predictions would be of great value to our amateur radio customers, military communication operations, and many others.

User requests for additional sensors included both solar x-ray and UV/EUV imaging systems. A solar x-ray imager (SXI) is under development for placement on a future Geostationary Operational Environmental Satellite (GOES). SXI imaging would significantly improve our real-time solar activity analysis and forecasting capability. A satellite-based UV/EUV imaging system would enhance our ability to determine parameters to be used in calculating satellite drag. Such a system may be incorporated into the SXI system.

Space Environment Services User Survey

To be used as input to the Solar-Terrestrial Prediction Workshop (see reverse side for details)

What information do you use? (Check all appropriate boxes)

Indices	Period		Forecast Period	Frequency of Use	Usefulness of Data	Other
	Past	Current Forecast				
Solar Flux	<input type="checkbox"/>	<input type="checkbox"/>	1. 0-24 hours 2. 1-3 days 3. 1-27 days 4. solar cycle 5. other	1. daily 2. weekly 3. monthly 4. yearly 5. other	1. essential 2. desirable 3. occasional use 4. unnecessary 5. other	(Please explain any reference to "other")
A Index	<input type="checkbox"/>	<input type="checkbox"/>				
K Index	<input type="checkbox"/>	<input type="checkbox"/>				
Sunspot Number	<input type="checkbox"/>	<input type="checkbox"/>				
Activity						
Solar flares	<input type="checkbox"/>	<input type="checkbox"/>				
Geomagnetic	<input type="checkbox"/>	<input type="checkbox"/>				
Active Regions	<input type="checkbox"/>	<input type="checkbox"/>				
Energetic Particles	<input type="checkbox"/>	<input type="checkbox"/>				
Ionospheric	<input type="checkbox"/>	<input type="checkbox"/>				
Other	<input type="checkbox"/>	<input type="checkbox"/>				

How do you get our information?
(Check all that you use)

- ☐ Alerts and warnings
- ☐ Bulletin Board System
- ☐ Telephone voice message
- ☐ Radio Broadcast WWV/WWVH
- ☐ File transfer from SELVAX
- ☐ Dial-in to SELDADS
- ☐ SGARF (Daily Report and Forecast)
- ☐ PRR (Region Report)
- ☐ SGAS (Solar-Geophys. Activity Summary)
- ☐ SCDR (Solar-Coronal Disturbances Rpt.)
- ☐ Neutral-line drawing
- ☐ GeoAlert
- ☐ Preliminary Report and Forecast (Weekly)
- ☐ Monthly
- ☐ Press Reports
- ☐ Images from SELSIS

What type of user are you?

- ☐ amateur radio operator
- ☐ aviation industry
- ☐ aerospace industry
- ☐ biological systems
- ☐ geophysical/seismological applications
- ☐ navigation systems
- ☐ pipeline company
- ☐ power company
- ☐ radio operations
- ☐ research
- ☐ satellite operations
- ☐ telephone communications
- ☐ television operations

What is the best way to provide educational material?

- ☐ paper copy
- ☐ workshop/conference
- ☐ audio tape
- ☐ video tape
- ☐ other

How do you use these services?

Are we currently meeting your needs?

Additional comments should be addressed to

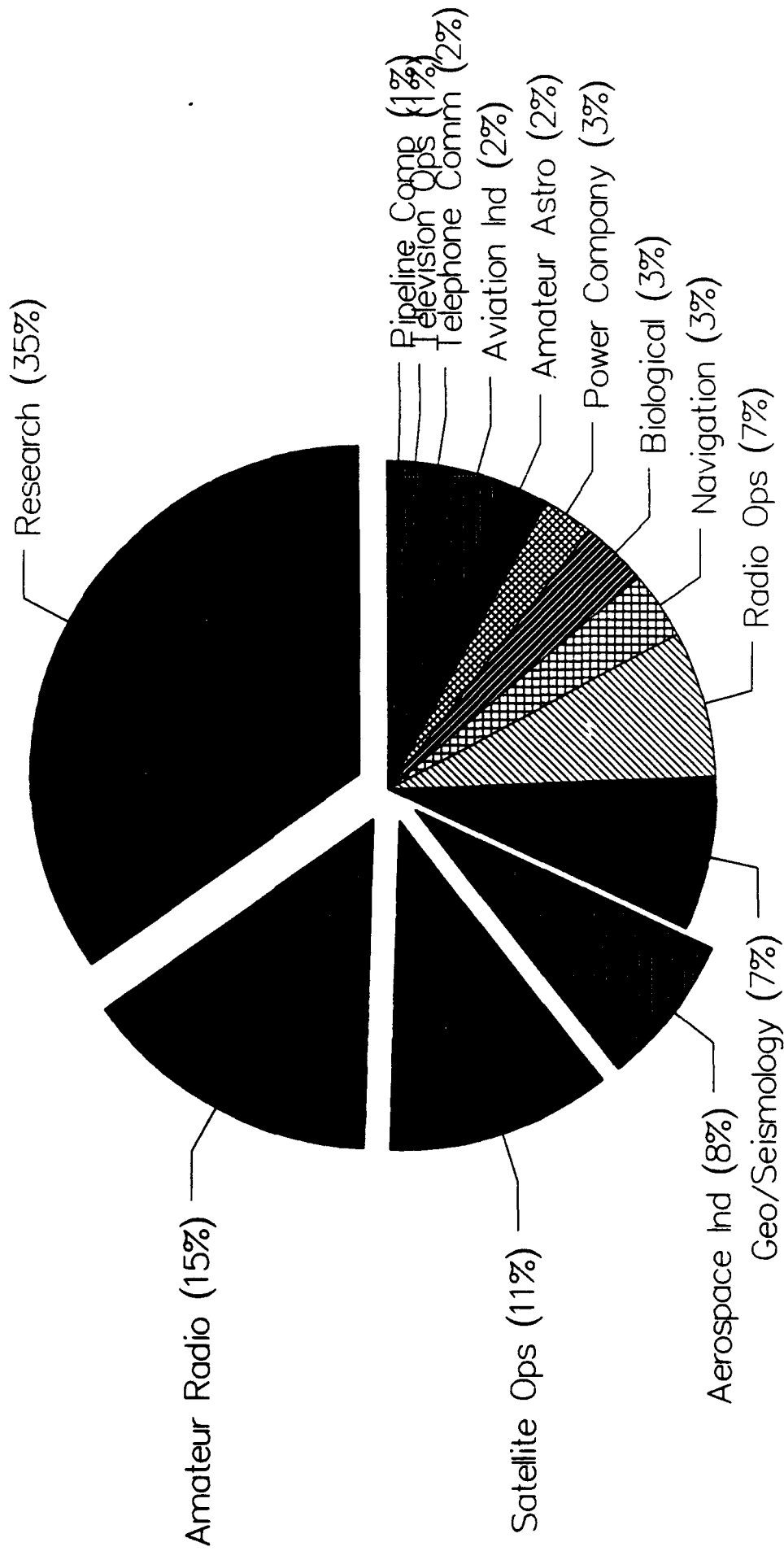
SESC Users Group, R/E/SE, 325 Broadway, Boulder, CO 80303.

Please correct your address, if necessary, on the reverse side; refold, and mail. Thank You.

Attachment 1

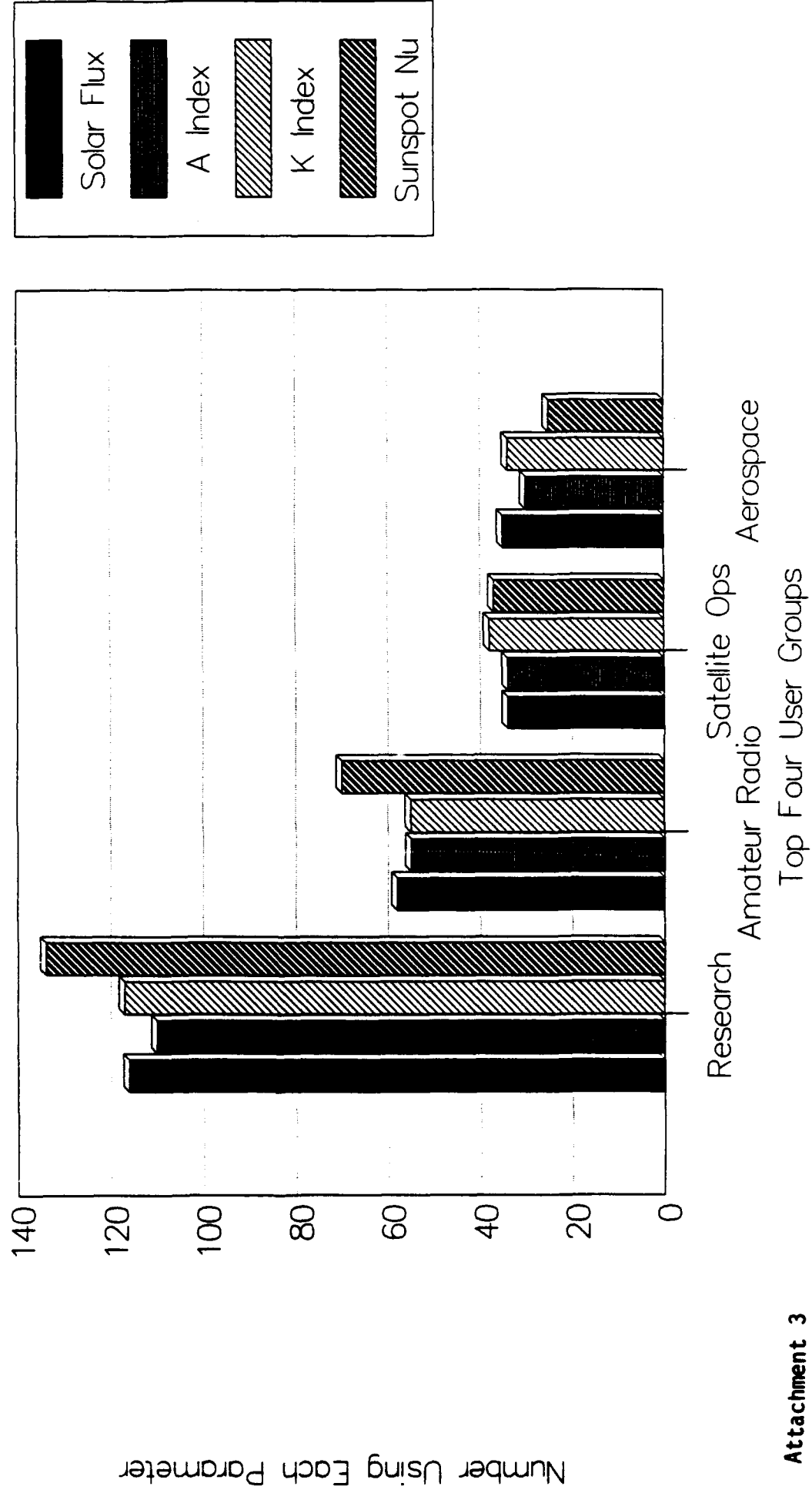
Percent of Users Responding

1991 Survey 1000 sent - 453 Responses



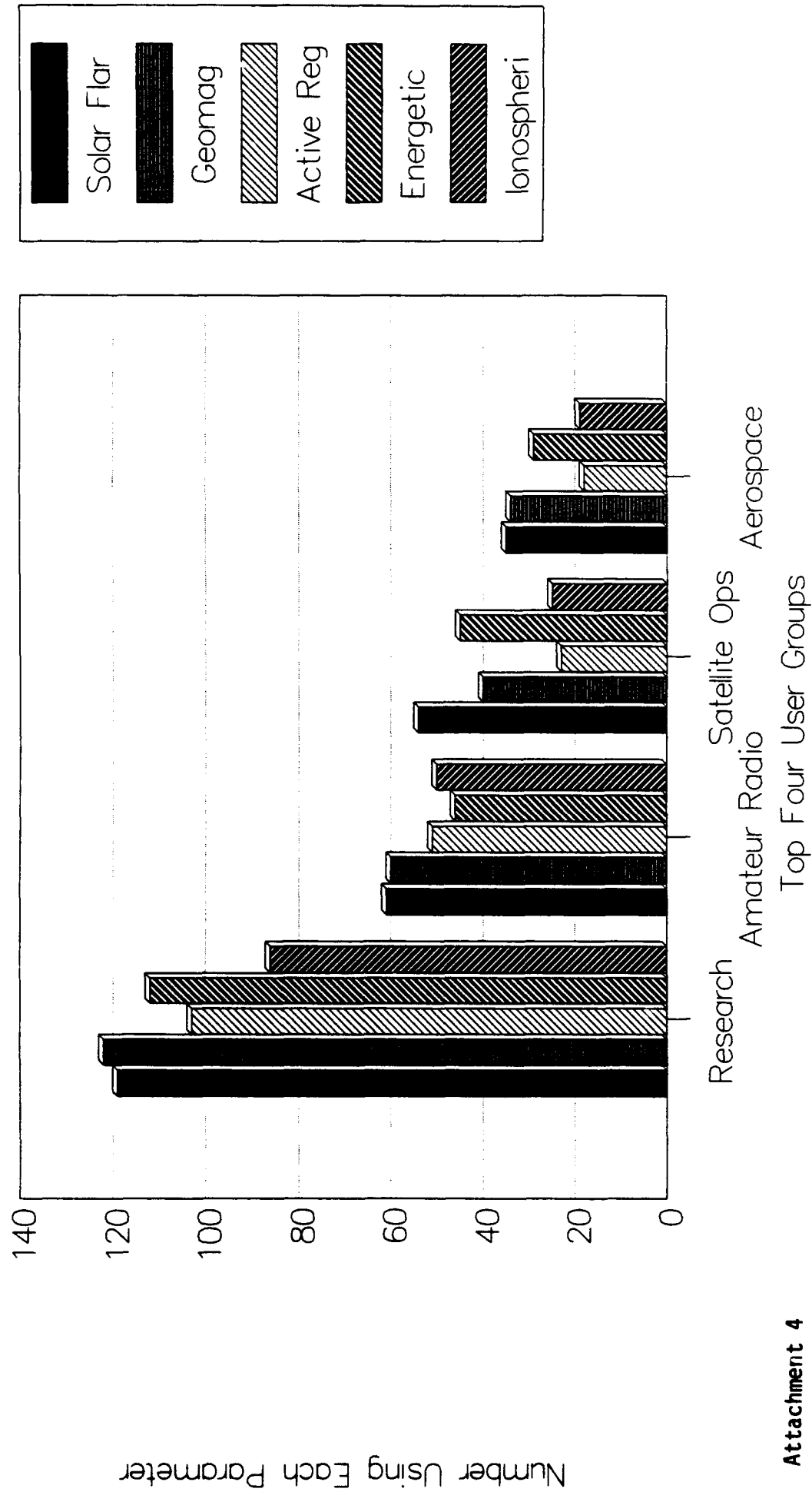
Indices by User Group

1991 Survey 1000 sent - 453 Responses



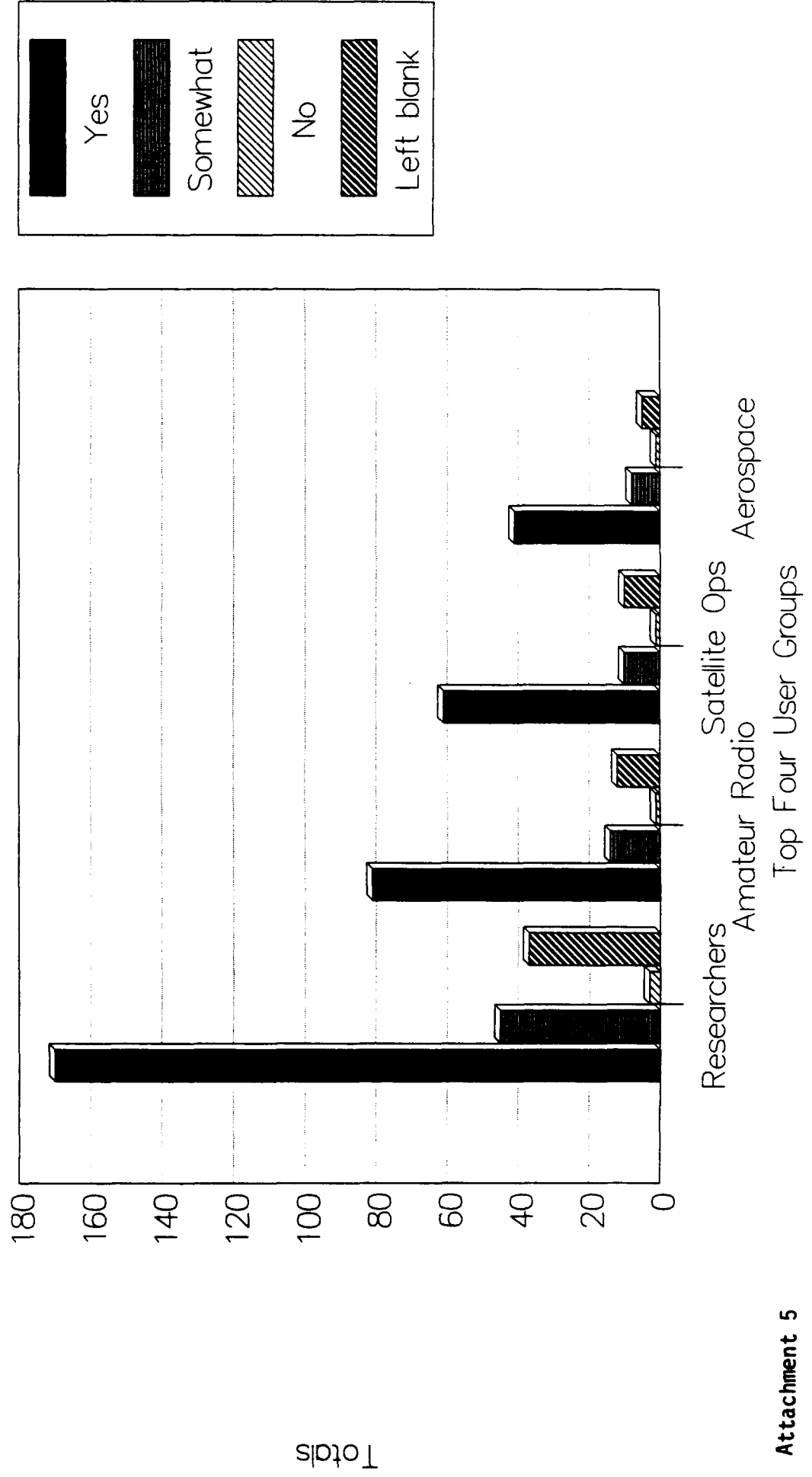
Activity Data by User Group

1991 Survey 1000 sent - 453 Responses



Are Needs of Users Being Met?

1991 Survey 1000 sent - 453 Responses



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